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USSR Report

ENERGY

No. 26

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FUELS

ELECTRIC POWER

PROBLEMS OF NUCLEAR REACTOR SAFETY

Moscow KHIMIYA I ZHIZN' in Russian No 6, Jun 80 pp 15-19

[Article by M. Muzyleva: "Reactor Protection — Protection From Reactor"]

[Text] Streetcar on Science Street

A streetcar runs along one of the most "scientific" streets in Moscow, Ulitsa Vavilova. It is a quite modern streetcar although, to be quite honest, it does rattle and thump a good deal on the rail joints, which makes it very difficult for people to work and sleep. But that is not the point. While running along a street of science, the streetcar exerts quite substantial influence on science.

All laser units at FIAN (Physics Institute of the Academy of Sciences) must be mounted on bases which are specially insulated from the building structure. There is another famous institute on Ulitsa Vavilova, not far from FIAN -- INEOS (Institute of Hetero-Organic Compounds). All of its microanalytical scales also stand on vibration-proof bases. Other scientific establishments adjacent to the streetcar tracks on this street have similar problems.

Each passing streetcar causes vibration of the ground, the pavement, and the walls of the buildings. We do not notice these minuscule earthquakes, but precision instruments respond to them with a considerable increase in instrument error.

Vibration is only one of the numerous interferences which affect instruments and scientific equipment in a large city. Noise, strong electrical and magnetic fields, and smog -- all these inevitable companions of urban civilization make operation of the precision instruments of modern science extremely difficult or impossible.

Closer to Nature

Today new scientific centers are situated away from large cities. The Joint Nuclear Research Institute at Dubna, Novosibirsk's Akademgorodok,

the observatory at the village of Zelenchukskaya in the Northern Caucasus, and research centers in the towns of Pushchino and Protvino. And of course it is not only that scientists seek to escape from the bustle of the city in order to devote themselves totally to their research. They carry sensitive and capricious equipment away from the city and closer to nature. This measure, using the language of the designer, is called protection by distance.

Perhaps for the first time protection by distance was utilized by the builders of the Pulkovo Observatory. "Vibrations caused by passing carriages, dust in the air, water vapor from the Neva...." -- these were the arguments raised in 1827 to explain the need to locate the telescopes beyond the city limits of Saint Petersburg. Of course today the carriages are not the same as those of 150 years ago, and the vibrations they produce are stronger, and the city air is no cleaner. In the Zelenchukskaya area, where the world's biggest Large Azimuthal Telescope was built, the air is transparent, the nights are clear, and there is little dust; conditions are ideal for astronomical observations. The radio interference level is minimal, and this fact predetermined selection of this site for the RATAN-600 radio telescope, which recently went into operation near Zelenchukskaya.

While telescopes are sited at quiet, remote locations in order to protect the equipment from the city, protection by distance as applied to nuclear reactors and accelerators is dictated by other factors. Here one must think not so much of protecting scientific equipment from the city as protection of the general population from ionizing radiation and powerful magnetic fields.

We are familiar with the case of the 6 GEV electron synchrotron in Cambridge, Massachusetts. Its designers did not concern themselves with protection by distance: the structure was erected 5 meters from a rather busy street and 20 meters from adjacent apartment buildings. In 1965 elevated radioactivity was recorded on the sidewalk by the synchrotron building. This naturally evoked loud protests by the people of Cambridge. Experts succeeded with great difficulty in reducing the radiation level to that of the natural-radiation background. There remained in Cambridge for a long time thereafter, however, a certain mistrust of the synchrotron -- the people of Cambridge endeavored to beat a wide path around this temple of modern physics.

At Dubna and Protivno research equipment is sited between one and a half and two kilometers from scientific and administrative buildings and living quarters. But protection by distance alone is insufficient to provide people complete safety.

He Who Does Not Risk....

We take risks our entire lives. We are walking along a knife blade, as it were. In crossing the street, one could be hit by the above-mentioned

streetcar, one could drown while swimming in a river, and even in one's office or bedroom one could become the victim of a heavy piece of falling plaster.

Nevertheless man is fairly safe. Psychologists claim that we feel absolutely safe when the degree of risk is estimated at 10^{-6}. In other words, we do not think about danger if the probability of a fatal outcome amounts to one chance in a million. If the risk reaches 10^{-5}, man begins to feel uneasy.

Is 10^{-5} large or small? U.S. statisticians estimate the probability of accidental death in the water at 3.7×10^{-5}, 9×10^{-6} in an airplane crash, and 4×10^{-6} in a rail accident.

In designing modern nuclear reactors, an individual degree of risk, degree of danger to each individual not exceeding 10^{-7} is permitted. In other words, an airplane (9×10^{-6}) and lightning (probability of being struck by lightning and killed is 5×10^{-7}) are more hazardous to us.

It is fairly simple to compute the probability of an accident while traveling on a train: one must divide the number of accident victims by the total number of passengers for a year's time. But how does one estimate risk for a nuclear reactor?

A method of calculating the degree of risk for nuclear reactors has been developed at the Massachusetts Institute of Technology. With this method one first of all establishes the probability of malfunctions of process systems (cooling systems, for example) and protection systems. This can be determined by equipment reliability data amassed during the years of reactor operation. One then estimates the probability of natural disasters (earthquakes, hurricanes, tidal waves) capable of damaging a reactor -- in the final analysis earthquakes are not an everyday occurrence; they all are recorded, and it is not particularly difficult to keep records on them. Now it remains to determine the possibility of an accident and (as a consequence) the radiation level in the adjacent area. If we know the population density in this area, it is not difficult to estimate the probability of hazardous irradiation for each individual, that is, the individual degree of risk.

Calculations for various areas and various nuclear power generating plants have shown that the probability of a person dying as a result of an accident at such a plant is truly negligible. It does not exceed 3×10^{-9} cases per year within a radius of up to 40 km from the plant. Thus the actual risk is two orders of magnitude less than allowable and four orders of magnitude less than that perceived by an individual. But is it not impossible to eliminate risk entirely? Evidently it is not, for it is impossible to eliminate a fatal concurrence of negligible-probability circumstances. He who does not risk not only does not play cards (an embellishment of highly doubtful quality!) but also does not work and does not live. Risk should be reasonable and judicious in all matters, however.

Therefore the designers and builders of nuclear reactors supplement protection by distance with a complex system of structural protection.

In Case of an Airplane Crash

Every nuclear reactor is equipped with practically failure-proof emergency protection, back-up cooling systems which start up when there is a sudden rise in temperature, by devices which confine fragments of radioactive substances, and by backup tanks in case of discharge of radioactive gases.

Obviously nuclear fuel is the principal source of danger. The principles of isolating it from the environment would seem to have been borrowed from the fairy tale about Kashchey the Immortal: under the oak is a trunk, in the trunk is a hare, in the hare is a duck, in the duck is an egg, in the egg is a needle, and on the end of the needle is Kashchey's death. The fuel is hidden away just as elaborately in reactors currently employed in the nuclear power industry.

Nuclear fuel is produced by industry in the form of pellets. The pellet matrix material, into which radioactive substances are impregnated, holds a large part of the fission products. This creates the first barrier. A fuel jacket serves as the next obstacle against possible leaks. These are zirconium alloy tubes filled with nuclear fuel pellets and hermetically sealed. If the improbable occurs -- if latent defects are discovered in the fuel elements and fission products (of course only a negligible percentage) enter the reactor coolant water, even in this case things are far from a catastrophe: the water circulates in a closed loop which is capable of withstanding enormous pressures. But even this is not all: the system is capped by a most important structural protection element -- a massive reinforced concrete shell.

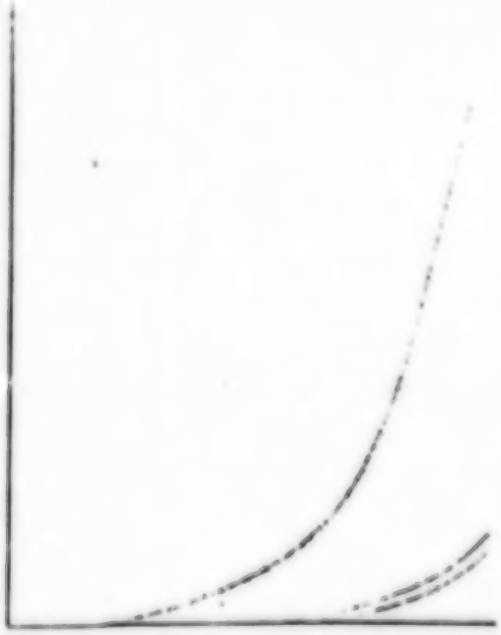
The walls and roof of the protective shell are so massive that they are capable of withstanding the onslaught of the most violent hurricanes ever recorded and the most powerful earthquakes. In recent years, in connection with expanded construction of nuclear power generating stations, an additional extremely-rigorous demand has been imposed on the protective shell: it must ensure safety of the reactor and, consequently, of the public in the surrounding area even if an aircraft plunges directly into the building.

Fortunately no such accident has yet occurred. But a catastrophic event model has been constructed in all details. A heavy combat aircraft (according to the scenario of Western experts, this would be a Phantom fighter-bomber) experiences engine failure and plunges from a high altitude onto a reactor's accident-prevention shell. The falling mass totals 20 tons, reaching a velocity of 775 km/h at the moment of impact. The reactor shell remains intact, and in addition there should not occur failure inside the shell which could result in flying fragments of reinforced concrete. The entire reactor building and equipment retain integrity, absorbing the enormous kinetic energy of the plunging aircraft, withstanding powerful vibrations of high amplitude and frequency (more than 10 Hz).

Thus a reactor is reliably protected even from such a catastrophic event as a falling aircraft. As they say, however, God helps those who help themselves. And the designers of research reactors and nuclear power stations carefully avoid siting their facilities at locations where the probability of an air accident is above average. We know that aircraft mishaps are most frequent during takeoff and landing, with the danger rapidly diminishing with distance from an airfield (by approximately 100 times at a distance of 8-10 km). Therefore it is not recommended that reactors be built in the vicinity of airports and in other areas with heavy air traffic.

Economics of Safety

One must pay for safety. Approximately one third of the cost of nuclear reactors in modern designs goes for structural protection and protection by distance. We are speaking of hundreds of millions of rubles, and therefore the problem of safety economics has naturally arisen, the problem of essential sufficient expenditures for protection with a constant minimum degree of risk -- 10^{-7}.



Distance From City Center

Cost of Construction Increases Sharply as an Accelerator Construction Site Moves Closer to the Center of a City and as Beam Intensity Increases

One can build super-massive accident-protection shells and protective covers, and one can erect double reinforced concrete walls lined with lead and other costly and short-supply materials, thus reducing the required protective zone. One can make the walls thinner but extend the safety zone around the reactor. Which is preferable? Economists reply to this question, taking land value into account. A square meter of land allocated for a project site in a remote part of the country, and at a location

unsuited for agriculture, may have an appraised value of less then 1 ruble; in Moscow, for example, the valuation of a square meter of urban land increases rapidly toward the center of the city and reaches a value of 160 rubles in the downtown area.

In the most general form, outlays on construction, equipment and site preparation (C_g) must satisfy the following simple conditions: $C_g=C_s+C_b \rightarrow \min$, where C_s -- total outlays on preparing construction site; C_b -- outlays on construction of buildings, including expenditures for equipment.

At the USSR Academy of Sciences GIPRONII [All-Union State Institute for the Planning of Scientific Research Institutes and Laboratories], where institutes and laboratories are planned and designed, a designing method has been elaborated which makes it possible optimally to combine structural protection of scientific equipment and protection by distance, to reduce safety expenditures to a minimum.

Let us assume that we wish to build a new intensive neutron and gamma radiation source. In principle it can be sited in an old institute building, or a special building can be constructed. Maximum allowable radiation doses on the exterior surface of the protective shell and at the boundary of the protective zone are adopted for the two alternative versions. Then the designers select the structural protection material -- concrete, lead, polyethylene, etc. Now, knowing the prices of materials and raw site cost, one can determine the cost of protection with various sizes of protective zone and building structural elements, and one can select that version which is optimal both from the standpoint of ease of operation and cost.

The following example attests to the economic effectiveness of the optimization approach to designing. GIPRONII has calculated expenditures on structural protection and a health-protection zone (approximately 600 meter radius) for a synchrotron with an energy of 1 GEV, with two siting versions: on "cheap" land, and on the edge of a large city. The results of the calculation are contained in the following table:

Construction Site	Method of Calculation	Site Cost, Rubles per Square Meter	Overall Outlays	
			10^6 rubles	%
"Cheap" land	Optimization approach	0.1	1.44	100
"Cheap" land	Without optimization approach	0.1	1.52	104
Edge of city	Optimization approach	10	10.34	711
Edge of city	Without optimization approach	10	11.20	811

A combination of protection by distance and structural protection, which is considered optimal today, will probably become unacceptable several years hence. Land is becoming increasingly valuable, and vacant land around scientific and industrial establishments is becoming more and more a luxury. Time is dictating the necessity of developing new structural methods of protection which are even cheaper and more reliable.

3024
CSO: 1822

WIND-POWERED GENERATING STATION

Moscow TRUD in Russian 28 Jun 80 p 4

[Article by Engineer A. Kuchushev: "Light Obtained from the Wind"]

> [Text] A wind-powered electric generating station has been designed in the Soviet Union, a plant which solves important economic and ecological problems. It will provide cheap electricity without consuming any organic fuel and will generate absolutely no air pollution.

We met V. Sidorov, chief designer of this unique power-generating complex and USSR State Prize recipient, at the Tsiklon Scientific-Production Association of the USSR Ministry of Land Reclamation and Water Resources. Vladimir Iosifovich is this association's principal expert.

"If the entire force of the winds blowing over our country," stated V. Sidorov, "were utilized to generate electricity, we could produce 20-25 billion kilowatts. Just compare: all electric power stations currently on-stream in this country -- hydroelectric, thermal electric, and nuclear -- produce somewhat more than 300 million kilowatts. This is why these stations are so necessary, facilities capable of converting free wind energy into electric power."

Simple wind-powered generating units have been operating for several decades now in various parts of the Soviet Union -- in Kazakhstan, in the Arctic, and in the Far East. They provide electric power to weather stations and remote villages. Recently many have been installed on livestock grazing lands, replacing expensive gasoline-motor water well pumps. But the most powerful of these units is capable of generating not more than 100 kilowatts.

"The multiple-rotor wind-powered generating unit designed at our association will be able to generate up to 40,000 kilowatts, equal to the output of a modern thermal electric power generating plant. In addition, it is free of the shortcomings characteristic of presently-operating models. Strange as it may seem, systems presently in use can work at low wind velocities. If wind velocity exceeds 20 meters per second, the unit must be shut down, for otherwise structural failure will occur...."

Yes, it is paradoxical, but a fact: the greater the amount of energy the wind would bring us, the smaller the capabilities to convert it into electricity. And then a bold idea was born at Teiklon: what was needed was a wind-powered generator which could withstand any wind velocity, and therefore would produce maximum return. In the past the entire force of the wind would be brought to bear on a single rotor, while in the V. Sidorov unit the entire load is uniformly distributed among eight rotors. In addition, in existing equipment cables, generator drives and other assemblies rotate together with the rotor, while in the new design all these components are fixed, and this enables them to operate at any wind velocity....

We should state at this point that power engineers have always in the past and unfortunately still display a guarded attitude toward wind-powered generating equipment. And this is understandable, for only invariable-frequency current should enter the power line, but if the wind dropped to zero, the generator does not operate, and the user is without electricity.

V. Sidorov also took this factor into account. Usually, in consideration of such instances, backup diesel-powered generators are provided at wind-powered generator plants. A new unit would require up to a 4000 ton fuel supply per year. This would not only contradict the idea of preserving the ecological purity of the environment but would also nullify the effect of obtaining free energy. As early as 1947 V. Sidorov was granted a certificate of invention for a wind-hydrogen unit which, in addition to generating electricity, could produce hydrogen from water. This idea was embodied by the designer in the new unit. Now during wind-still conditions electricity can be generated by burning previously-accumulated hydrogen in combustion generating units.

...The new wind-powered generator unit will be sited at the windiest location in the country -- the Markhotskiy pass (above Novorossiysk Bay), through which whip northeast winds from the Sal'skiye steppes at a velocity of up to 60 meters per second. Eight rotor-generators will be mounted on each of two 200-meter metal towers (they are presently being designed at the Proyektstal'konstruktsiya Institute). A water electrolysis unit will be sited alongside (water will be pumped up to the pass by windmills which are already in operation there), which will produce hydrogen. Gas storage tanks will be adapted to store the generated hydrogen. Current generated by the unit will be fed into the power grid through a converter substation. Just one such unit on the Markhotskiy pass is capable of generating more than 100 million kilowatt hours of electricity per year.

When this wind-power unit comes on-line, all the equipment for which is presently being series-produced by Soviet industry, our country will receive a new source of cheap electricity. Preparation of the technical documentation for construction of a wind-powered generating station is presently in the completion stages. Construction will take approximately a year and a half.

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CSO: 1822

ELECTRIC POWER

EKIBASTUZ POWER TRANSMISSION LINE

Moscow GUDOK in Russian 13 Jun 80 p 1

[Article by TASS Correspondent V. Ganzha: "Powerful 'Rays' of Ekibastuz"]

[Text] LEP-1150, an AC power transmission line, will improve the energy balance of the Urals and adjacent regions and will eliminate long rail hauls of tens of millions of tons of power coal per year. The first reinforced concrete foundations for the tall steel towers are in place on the first section of the main line between Ekibastuz and Kokchetav.

This line, which has no counterpart in world power transmission line practice, is designed to operate at 1,150,000 volts. It will stretch almost 1,500 kilometers in an east-west direction. The purpose of this power transmission line is to transmit power from the Ekibastuz thermal electric generating plants, the first of which is already in operation, to the Urals. LEP-1150 will make it possible to cover evening load peaks in power systems by transferring additional power from Ekibastuz, where it is already night at this time.

The Ekibastuz Fuel-Energy Complex development plan calls for running from Ekibastuz to various regions of the Soviet Union a "fan" of high and superhigh voltage power transmission lines. The first 500-kilovolt "rays" already link it with Western Siberia, Altayskiy Kray, Central and East Kazakhstan, and the Southern Urals.

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ELECTRIC POWER

EKIBASTUZ FUEL-ENERGY COMPLEX CONSTRUCTION PROBLEMS

Moscow KOMSOMOL'SKAYA PRAVDA in Russian 10 Jun 80 p 1

[Article by A. Babetov, head of KOMSOMOL'SKAYA PRAVDA volunteer correspondent station at ETEK construction site, and KOMSOMOL'SKAYA PRAVDA correspondent V. Ryzhkov: "Ekibastuz Assemblies"]

[Text] KOMSOMOL'SKAYA PRAVDA held a group interview at the construction site of the Ekibastuz Fuel-Energy Complex, attended by supervisors, specialists, and young workers. Several persons spoke at this meeting.

V. Chmelev, Komsomol group organizer of a Komsomol-youth installation brigade of the Energostroymontazh Construction Administration:

"We have placed high in socialist competition on numerous occasions and were the first to pass the million mark in completion of construction and erection work volume. But we almost failed to meet the target one month. Why? Because we, just as many other brigades on this project, suffer due to interruptions in organization of the work front.

"For example, right now we are completing crane facilities in the generator room of GRES-1. But our general contractors -- the GRES-1 Construction Administration and Energogidrostroy -- failed to complete on schedule the foundations for row A, failed fully to supply wall panels, nor are there fastenings for the crane tracks.

"I should also mention that our work force signed work relay agreements with Komsomol-youth brigades of supplier plants in Yermak and Alma-Ata. Everything went well at first. But now competition has faded away. Nor has the Komsomol committee displayed persistence."

N. Bugrimov, concrete reinforcement worker brigade leader of the GRES-1 Construction Administration:

"I'll back up Valeriy Chmelev. We are indeed experiencing considerable lack of coordination. For example, we are presently building the foundations for the traction-turbine machines. Coming up behind us is the

Komsomol-youth carpenter and concrete worker brigade of Lenin Komsomol Prize re.ipient Tolynbek Sarsenbin. We and they are running ahead of the timetable. Quality of the work is excellent. The work forces have given one another a firm guarantee on this score. But there is as yet no such agreement with the brigades of the Energostroymekhanizatsiya Construction Association."

F. Vanshteyn, section chief, Installation-Setup Administration, Teploenergo-montazh Trust:

"We came from Khar'kov to Ekibastuz to install the second turbine at GRES-1. We rushed here. We reported for work at the construction site on the very day we arrived. But we did not go to work immediately. It seemed that the installation crew putting in the first turbine 'borrowed' some equipment parts from us. We complained to them that they should have their own full set of equipment components. They replied that they of course did, but just try and find anything at the parts depot.

"We went to supply and were astounded -- it looked more like a dump. Now our brigade is 14 days behind schedule due to sluggishness on the part of the equipment division people."

Yu. Ivanov, director of in-construction Ekibastuz GRES-1:

"The station's first generating unit is still causing problems. It took a long time to put it on-line, causing great difficulty. And when everything was ready to go, the unit transformer was damaged during testing.

"Now the first generating unit is on-line. But there are problems which we have encountered in the past and which we shall continue to encounter in operating this unit: first of all, there is a shortage of personnel. And it is difficult to say where they can be obtained. Secondly, we are already concerned by the problem of fuel. Thirdly, we are not permitted to transport workshifts to the station from Ekibastuz by the rail spur. The USSR Ministry of Railways has stated that permission will not be given until construction of the entire complex is completed, and yet this will be about the year 2000."

Commentary on the Worker Meeting

The reports contain surprisingly unpleasant figures. Last year the Ekibastuz Energostroy Trust hired 5,982 persons, while 6,084 persons left jobs on the construction project.

People are leaving.... What is the reason?

Poor organization of labor. This is confirmed by figures: in-shift work time losses totaled 79,000 man-days last year.

Many are dissatisfied with housing conditions. There is no entertainment or recreation in town in the evening.

The problems of the EKEK construction workers are not new to the USSR Ministry of Power and Electrification. As the participants in the meeting attested, however, things at the all-union shock-work construction project are still improving very slowly. And not only the ministry should take steps, but also local Komsomol organizations in Pavlodarskaya Oblast.

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CSO: 1822

KIEV ENERGY SYSTEM PROGRESS REVIEWED

Moscow ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 2, 1980 pp 3-7

[Article by N.Ye. Grekalo, chief engineer of the Kievenergo PEO: "Development of the Kiev Energy System Over 50 Years"]

[Text] V.I. Lenin's brilliant formula "Communism is Soviet rule plus electrification of the whole country" has determined the path of the development of power engineering in our country.

Fifty years ago, on 30 April 1930, in accordance with a decree of the USSR Council for Labor and Defense a state joint-stock company was created for electrification of the Kiev and adjacent okrugs. The company was "Kievtok" and all high and low voltage networks of Kiyevskiy Rayon were turned over to it. At that time the installed electrical capacity came to 38,000 kilowatts. The output of electric power in 1930 reached 88 million kilowatt-hours with a specific expenditure of standard fuel of 915 grams per kilowatt-hour.

In 1930 in connection with the start-up of Kiyevskaya GES-2 [hydroelectric power plant-2] the need arose for rebuilding the electrical networks of Kiev and converting them from a voltage of 2.2 to 10 kilovolts. In 1930 the central electrical council under the Supreme Council of the National Economy of the USSR approved the plan for construction of Kiev electrical networks with a voltage of 10 kilovolts and put into operation in 1932 were six feeders with a voltage of 10 kilovolts and a total length of 37 kilometers.

During these years there was further centralization of the management of the electric power plants and electrical networks, and there was improvement in the organizational structure of the Kiev energy system, which beginning in 1935 was now called the "Kievenergo" RU [rayon center].

Created in the make-up of Kievenergo were: a dispatcher service and a protection service, a division of operations, repairs and capital construction, a planning and design division, a network administration with laboratories was organized, and there was an energy supply office and a repair plant.

In 1941 the installed electrical capacity of the Kievenergo system came to 120,000 kilowatts and increased more than three-fold during the 10-year period.

Begun back in 1935 in Kiev was the construction of heating networks, and by 1941 the length of trunk heating networks came to 12 kilometers, and the branch-offs came to 21 kilometers.

Before the forties in Kievenergo the equipment of old electric power plants was uneconomical. It was necessary to operate with a constant shortage of capacity and the absence of a reserve, which led to stoppages in the supply of electric power. The technico-economic indicators were low. However even then the collective of Kievenergo successfully solved many complex technical problems. The Kiev energy system became foremost in introduction of planning of the operating regimes, loading schedules and organization of management. This experience was used in other energy systems as well. A number of technical developments was used in improvement of the apparatus.

Alternating current was used for protection for the first time in the USSR in Kievenergo. Installed in all points of the cable network in 1933 were protections with an alternating operating current with saturated transformers of current, developed by specialists of Kievenergo; used in the laboratory of electrical networks was the induction method of determining the routes and places of damage of cable lines; and developed and studied experimentally was a circuit of a two-fold electrical APV [automatic reclosing], which subsequently was recommended by the People's Commissariat of Electric Power Plants for introduction in other systems.

During the period of the Great Patriotic War the electric power plants in Kiev were completely destroyed. After liberation of the city at the end of 1943 the turbine of plant No. 2 with a capacity of 2.2 megawatts was restored at Kiyevskaya GES-1, and started in 1944 was the planned restoration of energy enterprises in the city. Workers and engineering and technical personnel in the system manifested marvelous labor heroism and selflessness, restoring the destroyed electric power plants, networks and substations under wartime conditions and a sharp shortage of materials, spare parts and equipment. Even by the end of the fourth five-year plan (1946) the installed capacity of electric power plants of Kievenergo reached 39 megawatts. However this capacity was inadequate.

Begun in 1946 was the assembly of high-pressure equipment at Kiyevskaya GES-2. Assimilation of this equipment required a great straining of forces and a creative approach to the matter. Extensive work was conducted during this period for converting the boilers of Kiev electric power plants to the burning of natural gas.

By 1949 the installed capacity of the system reached 124 megawatts, and the production of electric power was 514 million kilowatt-hours.

The city's growing industry demanded a new increase in the distribution of electrical and heat energy. This problem was solved owing to construction of the Darnitskaya TETs [heat and electric power plant] which was started in 1951 and completed in 1960. The Darnitskaya TETs has reached the design capacity of 250 megawatts and 1080 Gcal per hour.

The decade of 1950-1960 was characterised by new qualitative changes: by the erection of high-voltage lines with a voltage of 35, 110 and 330 kilovolts going beyond the city limits, by growth in the installed capacity of electric power plants, by adjustment of the city network facilities, and by the start of work for complete electrification of the whole industrial region.

In 1961 the Kiev energy system was joined with the Kremenchug GES and the energy systems of the south of the Ukraine by a 33 kilovolt electric power line. Also introduced then was the first and later the second 50 megawatt turbogenerator at the Chernigovskaya TETs. Capacity was released from the Chernigovskaya TETs through a 110 kilovolt line. In 1964 the Cherkasskaya TETs with a capacity of 50 megawatts was transferred to Kievenergo, and in 1968 after expansion this plant reached the design capacity of 230 megawatts.

At the beginning of 1961 the installed electrical capacity of the system came to 495.1 megawatts. Output of electric power reached 2632 million kilowatt-hours, and 80 percent of this was by high-pressure units. The specific expenditure of standard fuel for the distribution of electric power came to 496.3 grams per kilowatt-hour.

The start of a new stage in development of the Kiev energy system was the erection and putting into operation of the Tripol'skaya GRES with blocks for 300 megawatts at supercritical parameters, begun in 1963 and completed in 1972. The installed electrical capacity of the GRES comes to 1800 megawatts. For the first time the energy system ceased to operate at a loss. With in-house consumption during 1971 at 13,293 million kilowatt-hours the output by plants in the system and by block plants came to 13,891 million kilowatt-hours, that is, 598 million kilowatt-hours of electric power was transmitted to other energy system along intersystem transit lines.

The rapidly growing housing construction in Kiev led to a shortage in heat energy. Therefore an important stage in development of Kievenergo was the construction and putting into operation in 1971-1976 of the highest capacity heat and electric power plant in the Ukraine--the Kiyevskaya TETs-5 with installed district heating blocks with a capacity of 250 megawatts at supercritical parameters of steam.

Experimental construction technology was introduced for the first time during construction of TETs-5. The frame of the main building was made of prefabricated beam constructions, and the foundation was on drilled and filled piles. The experience in construction of TETs-5 made it possible to recommend these new construction solutions as model ones for main buildings of TETs with T-250/300-240 turbines.

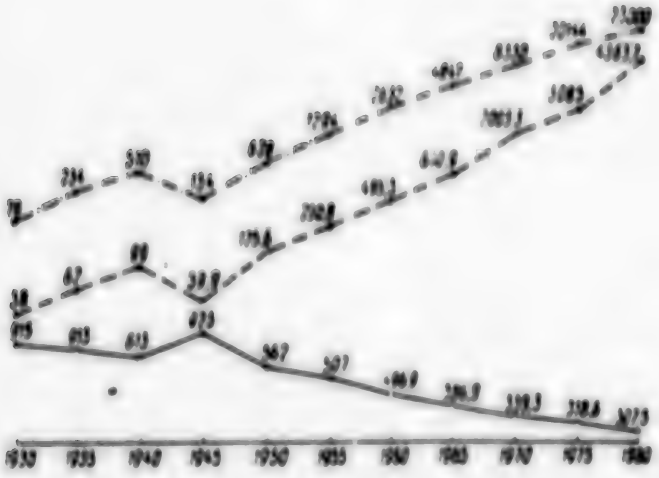

Figure 1. Technical-economic indicators of the Kievenergo energy system

-·-·-·- output of electric power, million kilowatt-hours
- - - - - installed electrical capacity, megawatts
——— specific expenditure of standard fuel for electric power released

The Kiev energy system is one of the most powerful systems in the Ukraine with respect to installed heating capacity and distribution of heat energy to consumers. The annual growth in distribution of heat energy in recent years has come to 1,100,000 Gcal on the average. The distribution of heat energy to consumers in 1979 came to more than 19,000,000 Gcal.

Presently in operation are hot-water pipes with a diameter of up to 1200 millimeters, and the length of the heating networks comes to 570 kilometers.

In fulfilling the decisions of the 25th CPSU Congress in the area of increasing the level of electrification of production and the effectiveness of the use of energy, centralization of provision of heating supply, and gradual elimination of small boiler facilities, power engineers of the Kievenergo PEO [Industrial Power Engineering Association] have done extensive work to remove from operation the obsolescent and physically worn out equipment of the Kiyevskay TETs-2 and conversion of TETs-2 to a heating boiler by remodeling the power plant boilers as hot-water boilers. For the first time in the Soviet Union power plant boilers with a steam productivity of 70-170 tons per hour were converted to operation in a hot water regime. They operate on solid fuel with the use of dust systems. The renovation done made it possible to provide heat energy to the consumers without building a new source of heat supply and made it possible to save the state more than 600,000 rubles.

During the years of the 9th Five-Year Plan put into operation in the energy system were 1,150 megawatts of generating electrical capacity, 23,576 kilometers of electric power lines of all voltages and 1,737 substations

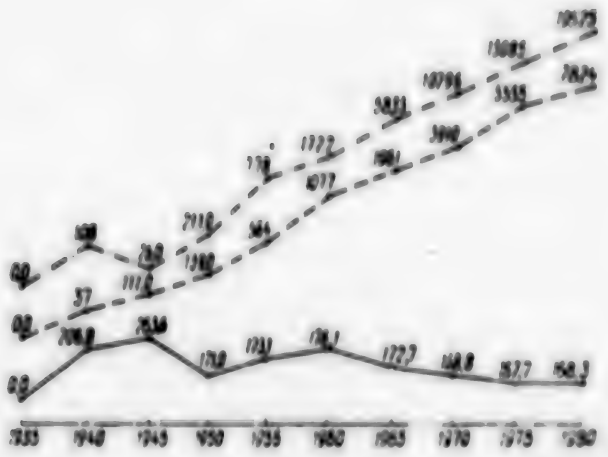

Figure 2. Technical-economic indicators of the Kievenergo Energy System .

-·-·-·- release of heat, thousand Gcal
- - - - - installed heating capacity, Gcal/hr
——— specific expenditure of fuel per release of heat energy, kg/Gcal

were built, and of these 1,715 substations and 22,741 kilometers of lines were for the electrical supply of agriculture.

In the 10th Five-Year Plan owing to reduction in the specific expenditures of fuel there was a saving of 125,000 standard tons and owing to reduction in the expenditure of electrical energy for in-house needs and losses in electrical networks there was a saving of 5.5 million kilowatt-hours of electrical energy. Incorporated into production were 13,351 innovations and 71 inventions with an economic benefit of 9,315,000 rubles. An economic benefit of 8,935,000 rubles was obtained as a result of introduction of scientific developments and measures for new technology.

Modern computer equipment is used extensively in the energy system. The first phase of an automatic control system (ASU) was put into operation in December 1974 in Kievenergo among the first five energy systems in the USSR. Introduced in the 10th Five-Year Plan were automatic systems for control of the technological processes of two blocks of the Kiyevskaya TETs-5, the Cascade of Central Dnepr Hydroelectric Power Plants, and the Kiev City Electrical Network. Put into operation in November 1979 was the second phase of the Kievenergo automatic control system. Automated at the present time are the processes of making the dispatcher log, control of operation of the devices of the automatic failure-prevention equipment, the issue of recommendations to the dispatcher under normal and emergency conditions, and evaluation of the current state of the 750-330 kilovolt network.

During 1980-1983 the following problems will be resolved: introduction into the operating practice of the basic technological services (Central Dispatcher Service--TsDS, TsSRZA [not further identified], Station Operating Service--SES, the SRES [not further identified], and others) with a dialogue operating regime with a single complex of electric power engineering tasks with a common data bank; daily calculation of the loss of electric power according to actual schedules of loads with full coverage of all distributing networks by calculations on the electronic computer; creation of a data bank for the basic equipment of the energy system; introduction of a complex of programs for automation of planning and analysis of technico-economic indicators on the basis of information received daily; complete transfer to electronic computers of the bookkeeping tasks for centralized enterprises of the city of Kiev and full mechanization of accounting for the rest of the enterprises using the forces of support points in oblast cities of the energy system; complete transfer of accounts with subscribers of the Kiev electrical and heat energy to electronic computers, and also mechanization of accounts with subscribers on the basis of the support points.

Introduction of powerful energy blocks, and the outfitting of the equipment with complex devices and automatic equipment makes higher and higher demands on the workers in power engineering enterprises.

In connection with this there is a particular increase in the role of recruitment, placement and training of cadres, of educating them in the spirit of high exactingness and responsibility for solution of the tasks set forth.

In the Kievenergo PEO this work is directed at increasing the production skills and business activity of the personnel, at instilling in them a communist attitude to labor, at securing reliable and economical operation of equipment. It is planned and regularly monitored, and is constantly in the field of vision of party organizations and the plant committees of the trade union. Used in this work are different forms of instruction, both with leave and without leave from production.

Three educational combines function in the Kievenergo PEO: the head educational combine of Kievenergoremont, the Kiev Left Bank and Chernigov Northern PES [not further identified].

Methodical leadership of all types of technical and economic training in the energy system is performed by the head educational course combine.

The educational combines have the appropriate academic bases, outfitted with auditoriums, laboratories, technical teaching devices, visual aids and training areas. In 1979 11,400 people completed the full course of economic education, 250 completed schools for foremen, and 900 with leave from production finished courses at educational combines, and 690 completed the people's university of technical progress.

The association collective is successfully completing the 10th Five-Year Plan.

In the course of the competition for achievement of the goals outlined, many valuable initiatives arose contributing to successful solution of the tasks placed before the production collectives.

Twenty-three enterprises of the industrial power engineering association have supported the slogan of the Rostov workers, "Work Without Laggards," the Zaporozh'ye initiative of "Manual Labor To the Shoulders of Machines," has been supported by 10 enterprises, and the initiative "A Second Life for Disassembled Materials" has been supported by 15 enterprises.

Competitions for profession skill, "The Best in the Profession," are held constantly, the main aim of which is achievement of high professional skill as the basic condition for improving the quality of work.

Participating in the competition for a communist attitude to labor are 23 enterprises numbering 22,344 people.

Out of the 24,654 people working in the system, 20,240 are competing individually for the title "Shock-worker of Communist Labor," and this honorary title has been awarded to 12,039 front-ranking production workers, or 52.5 percent.

The high title "Enterprise of Communist Labor" is held by Kiyevskaya TETs-5, the Cascade of Central Dnepr GES and the Kiev City Electrical Networks.

As a result of a broad developed socialist competition and for successes achieved the collective of the Kievenergo PEO, according to the results of work during the 1st and 2nd quarters of 1979, was awarded first place with the conferring of the Challenge Red Banner of the USSR Ministry of Power and the Central Committee of the Trade Union of Workers in Electric Power Plants and the Electrotechnical Industry, and for the results of work during 1979 it was awarded the Challenge Red Banner of the CPSU Central Committee, the USSR Council of Ministers, the All-Union Central Council of Trade Unions and the Central Committee of the VLKSM [Komsomol].

In honor of the 50th anniversary of the VLKSM the Cascade of Central Dnepr GES was awarded the title "Imeni Leninskogo Komsomola," and by Ukase of the Presidium of the Supreme Soviet of the Ukrainian SSR the Kanevskaya GES was awarded the title "Imeni 50-letiya SSSR." By a decree of the Council of Ministers of the Ukrainian SSR the Tripol'skaya GES was awarded the title "Imeni 60-letiya Velikogo Oktyabrya," and the Kiyevskaya TETs-5 was awarded the title "Model Enterprise of the City of Kiev."

At the present time the Kievenergo Industrial Power Engineering Association unifies 27 enterprises and production units. The installed

electrical capacity as of 1 January 1980 was 4,364 megawatts. In addition, the collective of the energy system takes an active part in construction and development of the fledgling of atomic power engineering in the republic, the Chernobyl'skaya AES [nuclear power plant]. Today the Chernobyl'skaya AES is operating stably with a full load of 2 million kilowatts. Next is the plant No. 3 power block with a capacity of 1 million kilowatts.

Great tasks face the collective of the Kievenergo PEO in the 11th Five-Year Plan. It is necessary to insure the putting of the Kiyevskaya TETs-6 into operation with T-250/300-240 blocks and the Chigirinskaya GRES with blocks of 800 megawatts. The Belotserkovskaya TETs will be expanded with the T-180/210-130 turbine units. It is proposed to perform a large volume of construction of electrical and heating networks, and substations of different voltages.

The collective of the industrial power engineering association is fully resolved to continue to work with still greater efficiency and enthusiasm on improving the quality and effectiveness of the power engineering industry.

10908
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KIEV HEAT SUPPLY SYSTEM DESCRIBED

Moscow ENERGETIKA I ELEKTRIFIKATSIYA in Russian No 2, 1980 pp 24-26

[Article by V.T. Omel'chenko, engineer: "Centralized Heat Supply in Kiev"]

[Text] At the present time in Kiev heat supply is accomplished from three heat and electric power plants with a total electrical capacity of $1 \cdot 10^6$ kilowatt-hours and a heat capacity of about 3,300 Gcal per hour. Released in 1979 from the Kiev TETs [heat and electric power plant] and rayon boiler facilities (RK) of the energy system was about 14.0 million Gcal, that is approximately 60 percent of the heat consumption.

The available heating capacity of sources of heat in the energy system exceeds 110 percent of the rated heat load of connected consumers. Receiving heat from the heat and electric power plant of Kiev and the rayon boiler facilities of the energy system are 8,287 residential and public buildings and 173 industrial enterprises. The extent of the heating networks from the TETs and the rayon boilers to local heating points comes to about 1,100 kilometers. The average specific expenditure of standard heat (net) at heat and electric power plants of Kiev during 1979 came to 255.8 grams per kilowatt-hour for released electric power, and 169.8 kilograms per Gcal for released heat, and at rayon boiler facilities it was 156.5 kilograms per Gcal. The annual growth in the heat load for Kiev on the heat sources of the energy system during four years of the 10th Five-Year Plan came to 280 Gcal per hour on the average, which is equal to the whole heat load connected with the heat sources of the energy system during almost the 20-year period from 1936 to 1955. Behind the figures for the annual growth in the heat load of the Kiev heat supply system are hundreds of apartment buildings, medical and children's institutions, schools and production buildings which are heated and fully supplied with hot water. Almost all the residential blocks of the city are provided with heat from the heat and electric power plant and the rayon boilers of the Kievenergo Industrial Power Engineering Association. Among them are such large blocks as Otradnyy, Nivki, Nikol'skaya Borshchagovka, Obolon', Teremki, and all the residential blocks of the left bank section of the city. Going for supplying heat to residences in the city is 77 percent of the heat energy released from collectors of the TETs and the rayon boilers, and 23 percent goes to industry.

Mainly water is used as the heat carrier for heating networks to satisfy the heat load of heating, ventilation and hot water supply for residential and public buildings, and also industrial enterprises. At the Darnitskaya TETs in addition to water, steam with parameters of 10.0 gage atmospheres and 250 degrees Centigrade is used for the heat supply of the industrial region.

In 1979 the share of water as a heat carrier in the total annual release of heat from heat and electric power plants and rayon boilers of Kiev came to about 87 percent. The use of water as a heat carrier makes it possible to use for heat supply the spent low pressure steam from the bleeds of heating system turbines. The utilization of spent low pressure steam for heating the network water at the TETs increases the effectiveness of central heating, thanks to an increase in the output of electric power by the combined method and to a reduction in the specific expenditures of fuel.

The climatic conditions of Kiev are characterized by a low calculated winter temperature of the outside air (-21 degrees Centigrade) and by a prolonged heating season--191 days. This creates favorable conditions for development of central heating in the city. Based on this in the 1970's put into operation in Kiev were the heating capacities of the TETs-5 and heating networks from it. The total electrical capacity of the TETs-5 comes to 700 megawatts, and the heat capacity is 1600 Gcal per hour. Built from the TETs-5 are heat networks with a maximum starting diameter of the pipelines at 1200 millimeters with a total length of more than 25 kilometers. The share of the output of heat from the TETs-5 in the total annual release of heat energy from TETs and rayon boilers of the energy system for the needs of the city in 1979 came to 25 percent.

Installed at the Kiev TETs-5 are large T-100 central heating turbines and the T-250 central heating turbines, the largest in our country. Improvement of the economic indicators of the TETs-5 is furthered by the expansion of the zone of heat supply in the summer period owing to hot water supply and switching the heat load from other sources along reserve lines of the heating networks.

Development of heat supply and central heating in Kiev was founded on a planned and scientific basis. The basic directions of development of the system for centralized heat supply in the city for the five-year period and more prospective periods are determined by a heat supply scheme. Further development of the centralized system of heat supply for the city is envisaged on the basis of concentration of the output of heat at high-capacity heat and electric power plants and large heating boilers.

Being built in accordance with the plans for development of the heat supply system in Kiev is the TETs-6, the first water-heating boiler for which the individual heat capacity of 180 Gcal per hour is planned to be put into operation in 1980. Utilization of inexpensive hot-water boilers of large capacity, both in the case of installation of them on the site of a TETs, and of one taken individually, in a number of cases yields a gain in the

sequence of capital investments, making it possible with minimum outlays for erection of a source of heat to centralize the heat supply or to eliminate the shortage in heating capacity in those regions of the city where putting TETs into operation or construction of networks from a TETs lags in time behind the introduction of heat consumers. After the central heating equipment of the TETs is put into operation, the hot-water boilers can be used for covering the peak part of the heat load or as a heating supply reserve.

The collectives of the Kiev unified TETs, the Darnitskaya TETs and TETs-5 are making a weighty labor contribution to strengthening the economy of Kiev.

Fulfillment of the assignments of the five-year plan by the Kievians is helped to a significant degree by the insurance of uninterrupted supply of heat energy for industry and the domestic needs of the city's population.

Heat power engineers have more than once been pioneers in the introduction of completed scientific research and new technology. Workers of the heating network of Kievenergo invented and widely introduced automatic equipment for systems providing hot water to consumers, which yielded a large economic benefit with respect to lowering the loss of heat during transport of the heat carrier and to reduction of specific expenditures of fuel for production of electric power.

Used for the first time here was a programmed schedule of regulating the release of heat, taking into account the change in heat consumption, both due to the temperature of the outside air and the velocity of the wind and the regime of the change in the load on the hot water supply. The use of the programmed schedule has improved the quality and economy of centralized heating supply.

The collective of the Kiev unified TETs has achieved significant success in protection of the heating networks against stray currents and the use of a new design of hot water pipes--a channelless design.

Responsible tasks are facing the heat power engineers of Kiev in the 10th and future five-year plans of development of the national economy with respect to further improvement in the quality, reliability and economy of the city's centralized heating supply. In order to fulfill these tasks it is necessary to insure in the planned periods the introduction of the capacities of the TETs-6 and the networks from it, rapidly to bring into use the newly introduced equipment, to insure timely and quality performance of capital repairs, and fulfillment of all the outlined measures for increasing the reliability of the heat supply system.

Important problems must be solved regarding an increase in control over rational and economical use of heat energy by the consumers and a reduction in the loss of heat during its transport and distribution. The collectives of the Kiev unified TETs and Energosbyt should intensify organizational work for mobilization of the collectives of enterprises which are consumers of heat energy, and the whole community of the city for a saving of heat.

10908
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ELECTRIC POWER

MORE ECONOMICAL ELECTROMETALLURGY PROCESSES NEEDED

Moscow TRUD in Russian 5 Jun 80 p 2

[Article by V. Zubanov, secretary of the Nikopol'sk City Committee of the Communist Party of the Ukraine, and M. Gasik, doctor of technical sciences, head of the department of electrometallurgy of the Dnepropetrovsk Metallurgical Institute, winner of the Ukrainian SSR State Prize, Dnepropetrovskaya Oblast: "The Technology is New, But They Are Operating As Of Old"]

[Text] Everyone knows that it is necessary to conserve electric power. From childhood we are taught to turn off the light when we go out. And this is correct.

But while achieving a saving of energy and fuel in everyday life, and demanding from power engineers in industrial enterprises that they reduce their expenditure, it cannot be forgotten that more electric power is consumed where it is a direct participant in the technological process. Namely here owing to improvement in technology, and better utilization of all heat and energy resources is it possible to achieve a considerable saving.

Unfortunately, in a number of sectors of the national economy consuming a large amount of electric power, and in ferrous metallurgy the economical technological processes are being introduced slowly.

The Nikopol'sk Ferroalloys Plant is located in the south of Dnepropetrovskaya Oblast. Metal is smelted here in ore heat-treating furnaces. More than 4,000 kilowatt-hours of electric power are expended per ton of ferromanganese.

This is not the first year that specialists in the department of electrometallurgy of the Dnepropetrovsk Metallurgical Institute have been engaged in development of an economical technology of production of manganese ferroalloys. And today we can affirm with every reason that the specific expenditure of electric power can be reduced by one-third owing to utilization of secondary energy resources. At just the Nikopol'sk Plant alone it is possible to save more than a billion kilowatt-hours per day.

During the smelting of ferroalloys in electric furnaces, so-called charging gas is formed. This is an excellent fuel. Its heating capacity is over two times higher than for blast-furnace gas. A certain part of the furnace top gas, approximately 20-25 percent, is used at the Nikopol'sk Ferroalloys Plant as a domestic and boiler fuel. All the rest is discarded and burned in the flare.

Is this not poor management with hundreds of millions of cubic meters of excellent critical fuel being used for... heating the atmosphere? Indeed there are proposals and plans to use charging gas for the production of chemical raw material, particularly synthetic motor vehicle fuel. We feel that this must be used first of all for improving the technology of smelting ferroalloys, in order to obtain as a result a saving of electric power, to increase the productivity of aggregates and to extract manganese from the ore more completely. This is also an important problem, for today the losses of manganese during production of ferroalloys reach 25 percent.

How does the technological process look today and why does it lead to a large expenditure of energy? In the ore heat-treating furnace, charge is primed at the temperature of the surrounding air. The unit is switched on, the electric power is supplied, and smelting begins. The simple heating of the materials goes up to 1,000 degrees. The chemical processes which convert manganese ore, coke, limestone, and quartz into the finished product begin after 1,000 degrees, when the melting of all the components is already started.

If the charge is heated beforehand outside the electrofurnace and fed into the unit with a temperature of 800 degrees, the expenditure of electric power for simple heating of the materials is excluded. It is also necessary to use the charging gas for this preliminary heating.

Hundreds of experimental smeltings have been done by the department of electrometallurgy of the Dnepropetrovsk Metallurgical Institute together with specialists from Mekhanobrchermet, and with planners from the Khar'kov Giprostal' Institute according to the assignment of the All-Union Soyuzferrosplav Production Association of the USSR Ministry of Ferrous Metallurgy. Excellent results have been obtained.

It has been shown that the new technological process--smelting with a hot charge--makes it possible not only significantly to reduce the expenditure of electric power, but also to increase by one-third the productivity of the units, to increase the extraction of manganese from the ores, and to reduce discharges of dust and gases into the atmosphere.

The first positive results were obtained back in 1968. It would seem that metallurgists should have been interested in the new effective process. But time is passing and the introduction of the progressive technology is not planned either for operating or for future plants, which now are just being planned.

A completely legitimate question arises: if smelting with preliminary heating of the charge is so advantageous, why is it not being introduced in the domestic ferroalloy industry? Here in our country more than 10 billion kilowatt-hours of electric power is expended for smelting manganese ferroalloys. Preliminary heating of the charge will make it possible to save one-third of this amount.

The first shops of the Nikopol'sk Ferroalloys Plant were planned long ago--at the end of the fifties. At that time there was no possibility of foreseeing all the innovations. But plans for new shops are being worked out now, and this means that it is possible to use units for preliminary heating of the charge in these shops.

The Khar'kov specialists have done this. But during approval of the plan in the Ministry of Ferrous Metallurgy of the USSR, the rotary furnaces were eliminated from the blueprints. The reason was the need to economize means for capital investments. And officials of the ministry insisted on the erection of out-dated shops. Is it possible to call such an approach to the matter a state approach: to economize on one thing and to commit a much greater overexpenditure of national funds for another!

At present final work is being done on the planning decisions for construction of very high capacity plants--the Bol'she-Tokmak and the Eastern Siberian. Life convinces us that it is necessary to build them at once according to the most modern and economical scheme.

It is understood that the outfitting of electrical furnaces with units for heating charge requires additional capital expenditures. Calculations show that thanks to an increase in the productivity of the units, to an increase in the quality of the output, and to reduction of the expenditure of electric power these expenditures are recovered two-fold faster than the standard periods accepted in ferrous metallurgy.

The question of promising paths of development of electrometallurgy as the most energy-consuming sector of ferrous metallurgy awaits urgent solution. And the sooner this is done, the faster the new technology will yield a large economic benefit.

10908
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NEW UNIT STARTS AT NOVOVORONEZHSKAYA AES

Moscow TRUD in Russian 1 Jun 80 p 1

[Article by A. Vysotin, Voronezh: "The Atom Works"]

[Text] Yesterday the fifth power block with a capacity of a million kilowatts went into operation at the Novovoronezhskaya Atomic Power Plant imeni 50-letiya SSSR.

On the background of the already usual cube-buildings of the four operating blocks a huge reinforced concrete cylinder has arisen, covered with a dome--the reactor department of the fifth power block has been located here.

"For the first time in domestic practice in building atomic power plants the reactor and the basic equipment of the first radiation loop have been covered with a cylindrical protective shell," we are told by the chief of the fifth power block, Yu. Akkuratnov. "The inside of the shell is lined with protective metal. Such a design insures the maximum safety for the surrounding environment during operation of the nuclear installation."

Rational configuration of the reactor department of the turbine room, and the auxiliary services considerably increased the flexibility of servicing the block. Owing to the cylindrical shape of the reactor section, the basic technological pipelines were "shortened," and it was possible to place more units on the same areas.

The fifth power block, which is the third generation of vessel water-cooled reactors, is the most powerful in the country among nuclear installations of this type. Almost no different from previous energy installations in dimensions, it has surpassed the first block of the Novovoronezhskaya AES (Atomic Power Plant) in capacity five-fold.

Water cooled reactors are very economical. The principle of their operation is based on that water is heated in a uranium flux to a high temperature and then steam is formed by its heat for the turbines. That is, here the water heats the water. It simultaneously performs the role of a neutron moderator--a regulator of the nuclear reaction (in uranium-graphite installations pure graphite is used for this purpose)...

Color television units, located on the main control panel of the block, an information complex, and a system of intrareactor control make it possible for the operator to check the status of the assemblies and aggregates at any moment in a zone inaccessible to man.

Now with the start-up of the fifth power block the capacity of the Novovoronezhskaya AES has reached almost 2.5 million kilowatts. In 15 years of operation the plant has produced over 85 billion kilowatt-hours of electric power, and has confirmed the high effectiveness of domestic equipment, and the reliability of all systems of control and radiation protection.

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ENTERPRISES URGED TO ADOPT GROZNYY CONSERVATION PLANS

Moscow EKONOMICHESKAYA GAZETA in Russian No 27, Jul 80 p 5

[Article by N. Semenov, First Secretary of the Groznyy City Party Committee: "Every Enterprise Should Have A Conservation Program"]

[Text] Maximum results in the matter of conservation can only be achieved if every enterprise has worked out for itself and is carrying out an orderly system of economic, production-technical, organizational and educational measures. This is something which was aimed at by decisions of the 25th Party Congress, the plenums of the CPSU Central Committee which followed and which is the purpose and recommendation contained in the works and speeches of Comrade L. I. Brezhnev.

The conditions of this competition for conservation and thrift at enterprises of our city were worked out with our workers taking a direct part in it. They, together with the leaders of subdepartments, representatives of public organizations, will determine the winners of the competition. And, when displays have been set up in every sector and shop, these informing workers of the daily results of the competition, then this use of visual aids will encourage leaders, will stimulate workers having only average indicators, and will urge the laggards forward.

If we were to speak as a whole, then it is thanks to the persistent work of party organizations and of all labor collectives at enterprises of the city that we have conserved, over the four years of the present five year plan, 237.7 million k.w.h. of electricity, 32,000 tons of petroleum products, 73.5 million cubic meters of gas, and over 15,000 tons of metal.

On The Basis Of Leading Experience

Decrees of the CPSU Central Committee as to the organizational and political work of the Kemerovskaya Obkom regarding conservation of fuel and energy resources at enterprises and construction sites of the oblast have been accepted by the city's party organizations as a specific program for action. The party Gorkom has seen to it that a program of conservation has been worked out at every enterprise. In so doing, it was important

to consider that the conservation of resources is a component part of all work aimed at improving the effectiveness of production. It is necessary to facilitate the reduction of all expenditures for the manufacture of products. In other words, we must systematically increase the productivity of labor, improve the utilization of basic productive funds, decrease the use of materials and energy, introduce wasteless production, and increase the quality of production.

Where such work is being done constantly, where party committees and bureaus are doing everything in their power to mobilize party members, trade union, Komsomol and other public organizations, people's controllers, there good results are achieved. Special commissions have been created at many of our enterprises and organizations which control the activities of administrative boards as to the utilization of energy resources, sudden visits have been made to verify the fulfillment of measures, and conservation questions are discussed regularly at shop, sector and brigade party meetings.

Good results in the conservation of electricity and fuel have been achieved, for example, by the work collective of the "Grozenergo" Association. On the average throughout the power system, the expenditure of fuel at the present time averages 281.7 grams per k.w.h. of expended electricity; at tets-1, that figure has been decreased to 198 grams. At that "Groznefteorgsintez" Association, by dint of the realization of measures for the utilization of secondary power resources, there was derived last year a quantity of heat sufficient to cover the productive needs of all association enterprises over the course of almost 2 months of work. At the Groznyy Railroad Car Depot and at the tank car washing-flushing station at Chervlennaya-Uzlovaya there has been introduced a system for the recovery of mazut left behind in tank cars after they are emptied out. This allows us to cover all of the heat expenditures involved in the cleaning out of tank cars out of this one source alone.

Quite an effect has been achieved at a number of organizations and enterprises through the utilization of secondary resources. Thus, at enterprises of the motor transport administration, through the renewal of junctions and units and the restoration of tires a savings of almost 1 million rubles is achieved every year.

The examples cited also demonstrate that high conservation results are achieved where constant concern is manifested. That is why city and rayon party committees try to see to it that mastery of accumulated experience by every collective becomes an important reserve in increasing the effectiveness of production. For dissemination of this experience on a wide scale we strive to make as full use as possible of the system of economic education and of schools for the training of cadres at base enterprises plus mass information media. Constantly, the gorkom analyzes the work of party organizations aimed at strengthening conservation practices and strives to improve organizational forms so as to influence more effectively an increase in the activity of labor collectives.

Discussed at plenums of the city party committee in recent times have been questions involving the work of city party organizations on increasing the role played by people's control agencies in the struggle for strengthening conservation practices. The status of resources conservation work is determined by summing up the results of a socialist competition. Beginning with last year, we make an effort to single out the enterprises which achieve the best indicators as to the conservation of fuel-power resources and metal on a quarterly basis.

This year, in conformity with the requirements of the November (1979) Plenum of the CPSU Central Committee, city party committees have formed groups of specialists who are working out conservation programs for the 11th Five Year Plan involving electrical and thermal energy and products of the oil extraction and petroleum refining industries, metal, the reduction of individual norms for the expenditure of material, labor and financial resources, and for the better utilization of the Earth's sub-surface heat.

The Contribution of Scientists

Conservation of labor and resources is closely tied in with the acceleration of scientific-technical progress. Our city has quite a bit of scientific potential at its disposal. There is a large detachment of scientists which works in our city's educational, branch of industry scientific research, design-technological institutes and design bureaus serving enterprises of our fuel-energy complex. City and rayon party committees concern themselves constantly over improving the political and organizational work of the party organizations of these institutions and seek to do everything possible to strengthen their influence over increasing the effectiveness of research, design and technological work. This will yield its own results.

At the Groznyy Petroleum Scientific-Research Institute under the USSR Ministry of the Petroleum Refining and Petrochemical Industry, for example, a new petroleum cracking catalyzer has been created. Its application has significantly increased the recovery of gasoline from the crude oil being processed. During the first year alone in which the cyclone dust extractors developed by the institute were used, this for entrapping catalyzer dust which has been carried off into the atmosphere together with smoke, enterprises in Ufa and Kremenchug saved more than one half million rubles.

Scientists of the North Caucasus Petroleum Scientific Research and Design Institute, in collaboration with production workers of the "Grozneft'" Association, through their development and introduction of highly-effective single-socket drill bits, of improved well designs, of new cement-blending equipment, and other technical decisions, achieved a reduction in the planned time for the drilling of prospecting wells of 11.6 percent and a reduction of 42.7 percent in planned time for the drilling of exploitation

wells, i.e., they were able to save 93 drill-months, which is the equivalent of the time needed to drill 15,000 meters in prospecting drilling.

This same institute was able to develop complexes of multicycle experimental equipment which facilitated the testing of prospective levels for oil and gas in open shafts of wells being drilled without having to lower highly expensive casing pipe. Introduction of these complexes allowed the USSR Ministry of the Petroleum Industry as a whole to derive an economic effect in the amount of about 5 million rubles and to conserve on hundreds of tons of highly-stable metal which is in short supply and on cement.

It must be noted, however, that the scale of application of this equipment, despite its very evident advantages, remains insignificant as yet. It is still not being used at enterprises of the USSR Ministry of Geology and the USSR Ministry of the Gas Industry. It could be successfully utilized also in the coal industry to evaluate gas content in mine shafts. This is caused by the fact that the industrial manufacture of such equipment has not yet been set in order, while the experimental work department of the institute can only manufacture 25 such complexes a year. The USSR Ministry of Chemical and Petroleum Machine Building should organize production of this equipment on a scale which will satisfy the requirements of industry. It seems to me that the USSR Ministry of the Petroleum Refining and the Petrochemical Industry should also be drawn into the resolution of this task.

There is no doubt but that, in our work for the strengthening of economy and thrift, there are still many gaps and omissions. The Groznyy city party organization sees as its main task here the liquidation of the shortcomings on hand as quickly as possible. This is acquiring particularly important significance right now because of the fact that collectives of enterprises and organizations are in the process of taking new and higher obligations upon themselves in order to meet, with honor, the 26th Party Congress--an illustrious event in the life of our nation.

PHOTO CAPTION

1. p 5. Good work indicators over a stretch of many years have been achieved by the collective of installation No 43-3 of the Novogroznenskiy Petroleum Processing Plant imeni Nikolay Anisimov. In the photo (from left to right) are a group of technologists from the installation--D. Donskoy, N. Yelagin (Chief of the Installation), G. Dudenko, M. Komarov, L. Martynova and N. Borshchov.

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CSO: 1822

'TSENTROLIT' PLANT'S CONSERVATION ACHIEVEMENTS HIGHLIGHTED

Moscow IZVESTIYA in Russian 31 May 80 p 2

[Article by Director A. Sagura of the Odessa "Tsentrolit" plant: "8 Million Kilowatt Hours of Electricity Saved Since the Beginning of the Five-Year Plan by Workers of the Odessa "Tsentrolit" Plant. This Is Enough to Operate the Plant for One Month"]

[Text] Our production uses a lot of people and, it must be added, a lot of electric energy. There was a time when the "Tsentrolit" Plant was frequently criticized for its overexpenditure of electricity, gas, mazut and coke. Now, the situation has changed.

Every year, the ministry establishes a so-called allocation norm for power resources to be used by the plant. A determination is made as to how much electric power we are to use per 1,000 rubles of goods manufactured. Thus, for 1975, a norm of 4,605 k.w.h. was set for this purpose; now, this norm has been reduced by more than one-fourth. Nevertheless, we are managing to achieve above-plan savings from year to year. Thus, in 1979, we saved 1,533,000 k.w.h. of electricity. What good did this do us? Over the 4 years of the present five year plan our volume of production rose by 61 percent while our consumption of electricity over the same period increased by only 11 percent. A considerable portion of our goods is produced with the aid of these energy resources which we have saved.

How are we able to achieve this electric energy savings? There is nothing small about this. It is of no little importance, of course, to see to it that lights do not burn in vain and that our lathes are not running idle. But we should not limit ourselves solely to the utilization of individual reserves. Let me make this comparison: Let us say that water is leaking from one spigot and that we are carefully collecting this moisture in some sort of container and that from another spigot the water is simply spurting out with no one paying any attention to it however. That was, in essence, the situation which existed at our plant before: we economized on our lighting but over-expended on electric power for our furnaces. Success, as we soon became convinced, is possible only if the struggle for conservation becomes the affair of not just our electrical service but of the entire work collective: power specialists, technologists, builders, designers and all workers.

We held meetings of party and worker activists at which we discussed this problem in all of its aspects and from all points of view. We were able to establish, as a result, the main directions of our attack upon it. We worked out, in particular, some rather stringent percentage norms for the expenditure of electricity and gas for every one of our shops. We set up a system of precise reporting and strict control over this matter. This procedure was introduced: overexpenditure of power resources carries with it infliction of economic sanctions and a decrease in or loss of bonuses while conservation of power resources held promise of increases in those bonuses. We also organized socialist competitions between the collectives of shops and services at our enterprises for the zealous utilization of energy resources.

A special commission has been created at the plant, the membership of which includes representatives of the administration, party and trade union organizations, and the people's control committee. At the end of every quarter, the commission hears reports from the directors of all shops and services. The talk there is specific: what is being accomplished through implementation of organizational-technical measures on the conservation of energy resources. The demand for their fulfillment is rather strict.

It must be stated that, today, we have already begun to make use, basically, of those reserves which lay on the surface as well as those reserves which were a little more deeply hidden. But we must proceed further. That is why, recently, we again conducted a meeting of the party-worker aktiv at which we discussed the main directions of our work.

We focused particular attention on the acceleration of technical progress. Our shops have been equipped with modern and highly productive equipment and the level of the mechanization and automation of technological processes has been increased. The enterprise is already exceeding its design capacity.

These deeper layers of conservation reserves include first of all the dissemination of leading experience in the utilization of intensive factors in the expansion of production. Engineers I. Chernov and I. Parshin, for example, proposed the reconstruction of our electric furnaces in order to optimize our technological process. They consulted scientists, who supported the idea of our specialists: that the winding in transformers had to be replaced, whereupon their capacity would increase by 30 percent. That was the result which we derived. Our 5-ton electric furnace now takes a 7-ton charge. Casting time has been reduced. All five of our furnaces are operating on a new schedule. The end result was a yearly savings in electric power of 3.5 million k.w.h.

In our pig iron casting shop, according to the design project, we had two cupola units: one had a productive capacity of 6 tons of raw pig iron per hour while the other had an 8-ton capacity. Each of the units, it goes without saying, was fitted out with complex equipment. Yet, could

not these two cupola units be replaced by a single unit? Such an assignment was decided upon by our builders. They took to the task and started to figure out several variations. The most economical of them was then introduced. The reconstructed 8-ton unit became capable of taking on a larger charge and now produces up to 14 tons of raw pig iron per hour. The 6-ton unit then became unnecessary, as did all the equipment connected with it. Electric power expenditure was reduced by almost one-half.

Or take this example. Casting production requires much compressed air. We have four powerful compressors, each of which requires up to 30,000 k.w.h. of electricity per day. Previously, one of these compressors was always kept in reserve while three were in operation. Now, things are so organized that we do without two of those compressors. Other measures were also carried out. Windows are used to provide light in shops; now, after application of a special cleaning solution, the glass in them stays transparent longer, with the result that less electricity is used to light up the premises.

We are devoting thought to this problem also. In the preparation of casting compounds, we use a pneumatic transport system through which the free-flowing material is tubed, all of which requires a great deal of power: the compressors maintain an initial pressure of 6 atmospheres. That pressure drops sharply in getting from one end of the pneumatic tubing to the other. Yet could not so-called boosters be installed along the tubing so that the compressed air maintains its pressure all throughout its length? In that case, such a large initial pressure of 6 atmospheres would not be required. Nor would such a powerful compressor be needed. In short, the very same effect could be achieved with less expenditure of enery resources.

Many other problems are on our agenda. We must give thought also to the replacement of patently obsolete equipment and to the introduction of automatics, particularly of automatic equipment which would control and regulate electric power consumption. The rational operation of equipment, units and mechanisms--this is also an urgent task. In short, the creative search goes on without interruption while our over-all money box of savings steadily becomes fuller. So it is possible for us to say (to rephrase a well-known saying) this about the efforts of the collective: our savings in electric power increases from rivulet to stream to a river of energy!

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TYUMEN' NORTH TODAY, PROGRESS REPORTED

Moscow PRAVDA in Russian 5, 6 May 80

[Two-Part article by V. Lisin and V. Parfenov: "Tyumen' North Today"]

[5 May 80, p 2]

[Text] In size, the taiga and tundra of Tyumen' North occupy an area which is equal to two Frances. Located here is our main storehouse of oil and natural gas. It is as far from the capital of this Tyumen land to the Polar reaches of the Yamal Peninsula as it is from Moscow to Tyumen'. Under the wings of the plane there is snow everywhere, even in April. This "white silence" is especially striking on the second leg of our flight—to the North of Nizhnevartovsk and Surgut, where the trees become fewer in number and where there is only endless tundra.

The population of this land of oil and gas has increased by more than half a million people over the past 15 years. The people here have built bright cities with populations of 100,000 and even more, have erected and set into operation thousands of drilling rigs on the fathomless swamps, and have laid down transcontinental pipelines which stretch to all corners of our nation. In this taiga and tundra, almost at the Arctic Ocean itself, people have erected on pilings plants which purify this fuel and which give it the resilient force to send it moving through those major pipelines.

In evaluating the heroic deed of our people in developing the productive forces of West Siberia, Comrade L. I. Brezhnev stated at the 25th Party Congress that "what was accomplished, what is now being done in that bleak land, is a genuine heroic deed."

1. The Heroic Deed Continues

A concrete ring of highway, like a tight orbit, encircles Lake Samotlor. Sparkling like silver amidst the trees are petroleum storage tanks, pipes, and blocks of equipment. If one were to touch the equipment through which the oil is gushing, one could feel the heat of the oil rising up

out of the depths of the earth. One has the sensation that it has always been so, that this largest of storehouses has served our people eternally. Yet only 12 years separates us from the day on which the brigade led by S. Povkha began to drill the first operational well here. That was the first and it is still pumping oil. Right next to it--a symbol of the people's achievement at Samotlor--is an obelisk, a monument to the discoverers of these oil sites.

Samotlor was not easy to conquer. Nature did little to show that it was hiding oil beyond the swamps and the wind-fallen woods of the taiga, surrounding them with "batches" of rivers and streams. Furthermore, it concealed the main treasure under the watery surface of a large lake. Arguments there were many but there was no time to spare. Here it was that the oil derrick builders decided to build an artificial island on the lake. In 30 degree below zero frost of January, they cleared snow off an area measuring 100 by 100 meters, dug through ice and silt down to firm ground, and covered the area to be excavated with sand. Thus it was that within a kilometer and a half from the swampy shore the first island appeared--a drilling foundation.

Now, ribbons of concrete road have been laid down along the lake. Along those roads travel people, with powerful equipment moving on them. Samotlor, having absorbed the work and the minds of thousands of people, lives on, functioning with all of its generous might.

However, this thought springs to mind: So, you've overcome all difficulties, the land has been conquered and beautified, but have you seen the fuel spurting up out of the ground? This is about the way one of our foreign guests expressed himself after glancing about last summer at the emerald moss encroaching upon the road, reminiscent of city lawns. "You are walking on top of it," his host responded, in a half-joking, half-serious manner.

After thinking a while, the guest stepped off the side of the road. Now the oil workers were worried: With his very first steps, their guest was in trouble. Concealed beneath that friendly green covering was the bog.

Samotlor has indeed been conquered. But nothing ever remains the same forever on earth. We must discover and master new Samotlors, large and small ones. As it turns out, it will not be easy to extract the oil and gas from this Tyumen' land, not just now, but tomorrow and over a period of many years. We were convinced of this more than once, after having visited with oil workers, with the people who are getting the gas out of the ground, and with the builders of these Northern cities.

Take, for example, our visit to the oil drilling site of foreman V. T. Gromov, a state prize laureate. The "battery" of wells drilled here fans out under the earth like the skeleton of an open umbrella. Here

it was the end of March, yet the frost and biting wind penetrated to the bone. A thick solution gave off smoke as it slid down a chute. Within the little van it was possible to get warm, to down some cabbage soup for supper, and to discuss brigade matters. For the drill rig functions round the clock and one's work never stops.

Eight years ago, together with his entire brigade, Vladimir Timofeyevich Gromov came to Samotlor from Kuybyshev. The climate of the Povolzh'ye area is, of course, milder than that of the Ob' River valley and the working conditions cannot even be compared, yet this 50 year old native of the Volga area would never think of leaving Siberia. What is it here that attracts him?

"If I had known what it is like, I would have left a long time ago," Gromov said, giving us a sly look. But he added seriously: "You'll never find any work which is more important than what is being done here..."

It reminded us of similar words spoken in Moscow, during ceremonies at which the Leninist Komsomol sent off to the shockwork projects of Siberia a new detachment of "Young Guards": "I am going out to Siberia not as a guest, not to eat Siberian meat pies, and not because my hands and my knowledge are not needed at home," painter Mila Levchenko from Dnepropetrovsk said. "There are things everywhere for a working man to do. But there are things which are most important. To them our party is summoning us today, that is, is appealing to our Komsomol hearts. We promise that in new, unconquered country we will create a new city, a city of our dreams..."

This aspiration to prove one's self, to test one's strength, to make a contribution towards strengthening the might of our Motherland--this is the important source of the labor heroism of our people. Otherwise, probably, one would not find in West Siberia such masters of their own fate as A. Shakshin, G. Petrov, S. Yagofarov, G. Levin and V. Gromov. Without it there would not be the rate of increase in the extraction of fuel, a rate which we have never seen before. The annals of the heroic deed accomplished by the Soviet people in Tyumen' provide this ever upward striving picture: By 1965, we had extracted our first one million tons of oil. Within 5 years after that, in 1970, our nation had received from Tyumen' 23.5 million tons of oil and gas condensate. By the end of the 5 year plan which followed, the annual extraction rate had increased to 143 million tons. Finally, in this closing year of the present 5 year plan, our plans call for the extraction of 315 million tons of oil and gas condensate.

"Our nation respects highly those people who labor here with honor and skill," First Secretary G. P. Bogomyakov of the Tyumenskaya Obkom has said. Tales of our heroes of labor are told in books and in movie epics, with our Motherland conferring upon the best of these the titles of Lenin Prize Laureate and Hero of Socialist Labor. On the map of the Tyumenskaya Oblast now appear ever more new sites, these named in honor of the first discoverers of oil and gas. This tradition, we think, is worthy of attention.

Every year, dozens of new oil and gas sites appear on the map of Tyumenskaya Oblast. Over the past year alone, this addition has consisted of 10 new storehouses and 28 new deposits located on "old" sites. The relative share of West Siberia in the nation's over-all extraction of oil increased from 9 percent in 1970 to 51 percent in 1980; for gas, the increase has been from 4.6 to 37.4 percent. This will increase even further.

In their search for new sites, geologists have covered the widest of expanses leading up to the Yamal Peninsula. The geologists have a term which they use: stages of oil and gas bearability. Urengoy possesses several of these stages. Their subjegation, of course, is something which cannot be accomplished over the course of one five-year period alone. The people living right up along the shore of the Arctic Ocean also are anticipating interesting yet at the same time difficult work. In these limitless areas we shall have to build new settlements and to create normal conditions for the work, life and recreation of hundreds of thousands of people.

We have accumulated quite a bit of experience in the construction of base cities and work settlements in the Tyumen' North. Let us cite but one such example. On the 64th parallel a multistoried new city has sprung up. It is the city of Nadym, which has been built almost from scratch. It is hard to believe that out here 8 years ago herds of wild reindeer were digging out moss from under the ice on the dismal tundra. Now, bright wide avenues course through the city, streets on which groups of gay little children run to school in the mornings, where lines of the very youngest citizens of Nadym line up at kindergartens and nurseries. It is a city which has a broad network of stores and dining rooms. In the summer, clusters of flowers spring forth from soil which had to be brought in from "the mainland."

"Our Nadym region has been lucky," states Gorkom Secretary Anatoliy Grigor'yevich Ryabchukov. "In an area equal in size to the German Democratic Republic, our geologists discovered three gas deposits, true giants: Medvezh'ye, Urengoyskoye and Yamburgskoye. The first of these is already having the design work on it done, while Urengoy will now provide us with 60 billion cubic meters of gas and will in time reach a level three times that high. Out at the Yamburgskoye gas site, which is located even further to the North, men of the reknown Nadymgazpromstroy Trust are preparing to land their forces. These extractors of gas have earned their fame. Over the 4 years of the present 5 year plan, the flow of fuel to the nation's center has tripled.

"In Nadym," the gorkom secretary continues, "we have reached the stage at which many people have ceased thinking of themselves as temporary visitors. The request for furniture in the city continues to increase, a request which we cannot always satisfy. This is a concern for us but yet it gladdens my heart because it means that these people will not leave and that they are setting down roots. We keep getting more and more letters like this: 'Please advise me as to whether I can bring my wife with me'. People are even coming here with their children."

In Nadym, the birthrate per 1,000 inhabitants is 18, which is the average for the nation. There are no grandfathers and grandmothers here. This means that, in the expansion of our Northern base cities, we are going to have to build considerably more institutions for children. It would be wise at the same time to put up enterprises which use the work of women--fish canneries and clothing factories. For we can, let us say, create some remarkable clothing and footwear from the hides of reindeer for our people of the North.

The more specialists that come out to this region, the faster we will be able to master these fuel sites of West Siberia. We are speaking of specialists such as geologists, drivers of vehicles, builders of major gas pipelines, of roads, cities and settlements, oil and gas field workers, engineer-specialists in automatics and electronics. There is no less a need here for specialists in the sphere of services, teachers, educators of children--people of virtually all professions and specialties.

The CPSU Central Committee and the USSR Council of Ministers have adopted additional measures aimed at strengthening the creative work which has been done in West Siberia and at attracting to this oil and gas complex new forces of builders from a number of ministries, republics and cities. This program directs the establishment of strict control over the delivery to West Siberia of housing structures or pre-fabricated parts and of construction materials and equipment. All of these measures are very logical: the oil and gas of the Tyumen' storehouse is needed by the entire nation and everyone ought to be interested in increasing their extraction.

Under these conditions, it is extremely important, on the one hand, to study as carefully as possible the experience which we have accumulated in the organization of construction in the North and, on the other hand, to analyze every lapse in order not to allow anything like it to happen again.

Of this we shall speak in the concluding portion of our report.

[6 May 80, p 2]

[Text] 2. The Region and Government Departments

There is a characteristic detail which one can observe in the cities and settlements of the Tyumen' North. At formal events and even at regular business meetings, many adults arrive hand in hand with their pre-school children. The corridors of the building occupied by the administrative board of the Urengoy Gas Field have small children playing in them. Someone joked: let the children administer the affairs of their parents.

To be serious, there is a critical shortage here of pre-school institutions for children. Mothers work with their children beside them. Only

one kindergarten for 300 children has been opened so far in the settlement of Novyy Urengoy. Yet there are 1,000 more applicants. Quite a few people here, like in other settlements also, live in old railroad cars and in shacks which they have puttogether themselves. Only one school is functioning and it is operating in three shifts. There are not enough stores and dining rooms. The time of the bachelor-pioneer is passing. Settled people are now travelling out to the North. If people do not bring their families with them immediately, they acquire them later right there on the spot. The settlement is less than 10 years old, yet there are over 4,000 children of school age.

There is no doubt about it: Decisive measures to improve the living conditions and the life of people are being taken in Tyumenskaya Oblast. During the first quarter of this year, three times as much housing has been put up as was built during the same period last year. Ever more distinct are the features of such contemporary cities as Nizhnevartovsk, Nadym and Surgut. Created here have been powerful combines for putting together pre-fabricated housing which gather more force with every day. Creators of our major trunk pipelines are skilfully resolving the housing problems of their workers, although that life is most "nomadic."

Yet it is still too early to rest on our laurels. The population of the Khanty-Mansiysk and the Yamalo-Nenetsk autonomous okrugs--because it is precisely here that the main extraction of fuel is concentrated--has tripled since the mid-1960's and yet housing construction is increasing at a more modest pace. Housing is often occupied by business offices, postal departments and savings banks. A particularly great deal of housing is not being used for that purpose in Nizhnevartovsk. Yet we are being forced to do this. People cannot get along without post offices, hospitals and stores, yet the territorial Tyumen' main administration under the USSR Ministry of Industrial Construction which is headed by A. S. Voznesenskiy is putting up such installations with particular reluctance and very slowly. Last year, that main administration fulfilled only one half its intended program.

It is no accident that local leaders begin their conversations at every meeting not with talk of the complexity of engineering decisions or even of the difficulties connected with material-technical supply. Invariably, they speak of the shortage of housing, of the need to improve communications decisively in the area, of the need to build roads more quickly. We can understand the situation of these local leaders. For the population of Surgut itself, this outpost in our effort to conquer these high latitudes, has already gone beyond the 120,000 mark while the development of the city's economy is proceeding very slowly. Here there is no unified sewage system and the water supply and heating systems are behind in their development. Situated on the outskirts of the city is one of the largest regional electric power stations in the area, yet the city is getting its heat from 25 small boiler facilities. It is a city of youth. Many workers would like to continue their education and to

engage in sports yet no affiliate of the oblast industrial institute has been opened in Surgut and there is a critical shortage of sports structures and cultural installations.

There is a saying in Surgut that one can run to the place one is trying to reach more quickly than one can get through to it by phone. There is a certain degree of truth in this joke. The representatives of over 20 government departments have set up telephone offices strictly for their own benefit and have suspended garlands of telephone wire upon posts in the city. It might be well for USSR Deputy Minister of Communications V. I. Glinka to visit the city and to see this scene for himself. Not just to look things over, but to take decisive steps to coordinate the development of the region's communications.

In putting the finishing touches to construction work in these Northern cities, government departments are not working in cooperation with each other and are duplicating each other's efforts. All this adds neither benefit, nor beauty, nor order within the city. The USSR Ministry of the Petroleum Industry has been designated as the sole contractor for construction work in Surgut yet has accepted its responsibility with reluctance and timidity.

It is very distressing that such order (disorder, to be more precise) is being followed by government departments in the development of cities and work settlements as well as in the construction of younger northern settlements. This statement applies, let us say, to the future city of Khanto, where wooden houses of varying sizes are being put up without any discernible system. Now showing up in the city and its environs at an ever more rapid pace are small departmental construction bases belonging to oil workers, gas workers, builders and geologists.

Where are the masters of this future city? In the settlement of Khanto, we barely located the plain and hastily thrown together building belonging to the settlement soviet. It had very few people in it. Is it possible for such an agency of local authority to become the center for all affairs and to actually influence their course from the very first days of the city's birth?

It is not possible to overcome through conversation alone the lack of coordination of government departments and outmoded views as to the resolution of social problems. Right now, we need to know the fate of every Northern settlement: Where the cities are to be located, where the settlements are to be placed. It is important to see to it that oblast and okrug soviets of workers' deputies and their city planning and architectural services actively influence the state of affairs and that they remain ahead and in control of the rapid expansion of settlements in the region.

Up in the Tyumen' North it is particularly important that base cities located not very far from fuel deposits be built very quickly. Working settlements ought to be based close to the oil fileds. This will allow us to get people to their work quickly and to return them for rest and to rejoin their families within a week or two. In a number of instances, this is what is being done. However, every 2 weeks thousands of people fly into Siberia from Bashkiriya, Kuybyshev and even from Simferopol' and Moldavia to go to work. They spend half a month at work and then go back home for 2 weeks. Such "pendulum expeditions" of course run into money and the people who come in twice a month change their time and climatic zones, with the result that their work productivity is lower than that of local residents. When quality housing is available in Siberia such expeditions will not be required in the future.

What can we use to build houses out in the taiga and tundra? It is both difficult and expensive to haul in reinforced concrete and brick from other oblasts. Housing construction combines are being introduced rapidly into our base cities. That is one way of doing it. Another way is to make wide use of local possibilities for both wooden housing construction as well as for the erection of brick houses. Clay is available here and, if we were to create an inexpensive network of brick factories which are semi-automated and which could produce large brick blocks, we could resolve the problem of housing much more quickly and inexpensively.

Everything begins with roads. This is a particularly pressing problem as far as the taiga and tundra are concerned. The experience of the past decade has proven this to us: Construction of cities and settlements should begin with the laying down of roads, that is, we should triple the rate of such work and not tolerate equipment being "scattered" all over the swampy area. Functioning inter-field roads and winter roads in the Tyumen' North are becoming ever more crowded with vehicles. In operation here are 50,000 powerful trucks, tractors and construction vehicles. In flying over the tundra by helicopter we have seen traffic jams many times, with vehicles lined up bumper to bumper for a kilometer or more. All because roads are few in number and because we have been building them at an intolerably slow rate.

Even the textbooks on the oil business tell us that we can master our oil fields only after roads have been built to run alongside future pipelines and between the various fields. The Medvezh'ye Gas Field has been in operation for 8 years, yet it has only one-third of the roads which it needs to serve it. This very much complicates and makes more expensive our work there.

Up in the north there is no installation which could pay for itself more quickly than a concrete road in good condition which can be used the year around. That is why our oil and gas field workers acknowledged with such satisfaction the decision of our party and government on the rapid expansion of road construction within our nation.

It is well known that there are not enough people up in the Tyumen' North. Yet how can we use more effectively the people who have already arrived there? Within the Urengoygazdobycha Association, every third worker is a power specialist who maintains a miniature diesel electric power station. Yet at the same time, the powerful GRES in Surgut has no one to whom it can send its electric energy. One of the generators there had to be brought to a halt because the USSR Ministry of Power and Electrification has not completed construction of an electric power transmission line out in the direction of the Northern cities.

There is yet another local reserve of labor resources. In operation at the more remote pipelines are hundreds of compressor and pumping stations. They are rapidly increasing in number. Presently, dozens of people serve as maintenance men on every one of these stations. Yet we have had experience in operating these compressor stations for months without people--they are operated with the aid of teleautomatics. It seems to me that our instrument builders and electronics specialists are capable of automating the work of these stations out in the taiga and tundra, thus freeing tens of thousands of operators.

In order to keep our cadres out in the North we must give deep thought also to the question of payment for their labor. Here is what R. B. Dadashev, Chief Economist of the Nadymgazprom Association told us. It is well known that people who come out to work in the North conclude contracts for a definite period of time. If that person decides to remain at the same job, he extends the contract. For doing this, he receives additional half-pay. But if the same worker were to transfer to a nearby city or settlement and to conclude a new contract there, he would be offered two salaries plus half-pay for members of his family. Can we label as logical such a procedure which has been established by the USSR State Committee for Labor and Social Problems?

Almost 20 years have elapsed since the initiation of the region's reformation. Many of the veterans who began this great work out here have already retired on pension. They could return to the "Mainland" and surrender their housing to young workers; however, they also must have an apartment in the center. These Northern workers have the money, yet it is not easy for them to join housing cooperatives; it is even more difficult for them to purchase an apartment outright. Evidently, what we should do is to expand the list of cities on the "Mainland" which are obligated to build cooperative housing for veterans of the North. We should establish specific assignments for those city executive committees and strictly control their implementation.

So, as we can see, increasing the extraction of oil and gas in West Siberia is directly dependent upon the resolution of our social problems. We have the capability to resolve them. Our main support for this is the accumulated experience, knowledge and enthusiasm of the Soviet people. The additional measures which our party and government have adopted to

strengthen construction there over the next few years calls for the aid of all our people to be given the people of Siberia. Considerably more good housing is to be built every year by Moscow residents. In the next 3 years, they are to build 200,000 square meters of high-quality housing in Nizhnevartovsk. The Moscow Main Administration for Construction is to create there a powerful construction administration and to organize the work of its collective on the level which has been achieved by Moscow.

At the same time, Ukrainian construction workers are to put up 150,000 square meters of housing in the Tyumen' North. They have already put together the first installation train. Leading work detachments comprising approximately 750 people will be taking along with them their own temporary housing, dining room replete with cooks, and polyclinic with their own doctors. In short, they will be equipped down to the nails with which they will begin their work. Right now, the main thing is to organize with skill the reception of these incoming detachments, to designate zones where their equipment and materials are to be unloaded, to equip approaches to where they will be commencing their work, and to set in order their living conditions.

We are rightfully proud of the fact that the program for the development of the West Siberian fuel complex, as designated by the 25th Party Congress, will be fulfilled successfully. Over the 4 years of the past five-year plan, the extraction of oil in the Tyumenskaya Oblast has almost doubled while the extraction of gas has increased 3.3-fold. We must now wrap up the assignments of the five-year plan not only within our economy but also within our social sphere. And, at the same time, we should prepare for a new sweep of work, for the conquering of even higher levels designated for the 11th Five-Year Plan by the 26th Party Congress.

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NOVOKUZNETSK: NEW COAL FIELD CONSIDERED IMPORTANT ACHIEVEMENT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Jun 80 p 1

[Article by V. Kladchikhin, Novokuznetsk: "Coal of a New Field"]

> [Text] The personnel of the Nagornaya Mine in Kuznetsk started to develop a new rich coal field. They are sinking shafts toward 10 thick seams which will be extracted with the aid of high-capacity equipment and progressive fuel extraction techniques.

Not so long ago the stillness of these taiga dumps was disturbed only by the roar of machinery from the nearby mine. But now the whole area has become one big construction project. High-capacity conveyors will deliver coal onto the surface from the underground seams. A rail loading station will arise, as will a power substation. In a word, everything is being done solidly and substantially.

Twenty kilometers separate the new Kusheyakovskoye Coalfield from the mine. The miners are resolved to transfer to the new field not only the bulk of extraction but also the rich traditions of the personnel of the Nagornaya, who for 10 years, month after month, have been exceeding their assignments.

Mine director Viktor Mikhaylovich Yerpylev says: "Actually, today we enjoy the fruits of a technical policy initiated more than 10 years ago when emphasis began to be placed on concentration of production, and maximal mechanization, which made it possible sharply to increase the load per stope. Instead of 10-12 low-capacity galleries, only three are used, but these three are equipped with mechanized coal-cleaning gear. The annual extraction per gallery is 600,000 tons of coal. The seams are prepared for extraction by two high-speed combine tunneling brigades.

Last year the miners again exceeded the two-million extraction level and overfulfilled the target by bringing up an extra 160,000 tons to the surface. The initiators of the oblast-wide competition--the brigades of the Heroes of Socialist Labor Yegor Drozdetskiy and Aleksandr Nikitin and the Komsomol youth crew under Rudol'f Stakheyev--distinguished themselves. Emulating

the leading tunnelers, the brigades of the USSR State Prize winner Vladimir Gayday and Aleksandr Shcherbakov tunneled a total of nearly 15 kilometers of mine passages.

There exists a good tradition at Nagornaya: the mechanical experts, repairmen, and production innovators will not lower any machinery underground until they completely test its performance under local conditions. At A. Nikitin's stope the KM-81 can hardly be recognized after it has been rebuilt by innovators. Each section is supported by two struts, and the complex itself has become narrower. This was true because the conditions became so difficult that it was almost crushed. The dual struts and the rebuilt timbering partition were saved. All this work had moreover taken place without interfering with the flow of extracted coal.

All workers, engineers, and administrators have joined the movement bearing the slogan "Creative Searches are the Business of Everyone." As a result many machines were created at this mine and are now being successfully used at other enterprises. Consider the assembling crane. This device "piles" onto itself an entire timbering section and delivers it to the underground chamber where it is to be installed; whereas, previously the section had to be hauled in fragments and its assembling was time-consuming.

Consider another important experience: the rate at which the timbering is transferred from worked-out stopes to new ones, as achieved at Nagornaya, is twice as high as the branch-wide average. How was it accomplished? Again with the aid of the experimental team headed by N. Chernykh. The solutions to seemingly hopeless situations arrived at by that creative team have been simply too numerous to count or to remember.

The team's achievements as regards the present-day production rate also deserve praise. Most of the extraction has to be done at an angle at which ordinary coal-cutting combines do not work. The problem was solved by the experimental team, which designed the Kuzbass Combine, for which they received the USSR State Prize. With the aid of that combine, the brigade of Vladimir Gayday tunnels 8-9 km of drifts daily. In its 8 years of operation this machine has never broken down.

The creative efforts of the innovators produced nearly a million rubles in savings last year. Over a period of 10 years their endeavors served to double labor productivity and load per stope.

The personnel of the mine, which at one time was to be shut down owing to the depletion of the seams, now awaits the future confidently. And in the meantime the miners stormed the first frontier so far this year: they fulfilled ahead of schedule their five-year coal extraction target.

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BRIEFS

MULTILAYER GAS PIPELINE--Nadym, Tyumenskaya Oblast--As is known, Northern Tyumen' is extremely rich in natural gas deposits. Steel pipelines which are many kilometers long are being built to transport that gas to the nation's industrial centers. But their construction requires huge outlays. How are these outlays to be reduced? This difficult problem was tackled by scientists at the Institute imeni Paton, the All-Union Institute for the Construction of Main Pipelines (VNIIST), and the All-Union Scientific Research Institute of Gas, jointly with experts from the Glavsibtruboprovodstroy Main Siberian Pipeline Construction Administration. They have just completed a series of unique experiments with, essentially, the use of multilayer pipe to transport gas under the rigorous Northern conditions, for the first time ever. The test program provided for the most unexpected situations arising during the operation of the existing pipelines. And the new pipe passed its tests well. The use of multilayer pipe will serve to greatly reduce the inside pressure in the pipeline and to augment its flow capacity. This means that the outlays on pipeline construction in the North can be markedly reduced. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Jun 80 p 2] 1386

PAVLODAR PETROLEUM REFINERY--The Pavlodar Petroleum Refinery continues to be built and expanded. Recently its bitumen shop also has been put into operation. Its operating trials continue. Once its capacity is utilized, bitumen output will amount to 500,000 tons per year. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Jun 80 p 2] 1386

MINING INSTITUTE--Yakutsk--The Far North Mining Institute has been established in Yakutsk. Its purposes include research in thermal and mechanical processes in permafrost rocks, the development of a new extraction technology, scientific substantiation of mining operations, and problems of the organization of labor at enterprises of the South Yakutsk Coal Complex. The Institute will also work to develop new methods for mine dust control. The scope of activities of the new institute includes not only the enterprises of the northern republic but also the entire Northeast where miners extract various metals in permafrost. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Jun 80 p 2] 1386

NEW GAS ENGINE COMPRESSOR--Gor'kiy--The Dvigatel' Revolyutsii Plant in Gor'kiy is testing the GM-12 1000-HP gas-engine compressor. The new compressor is designed for the petroleum and gas extracting industry. It will be used to collect and pump gas as well as to pump it into petroleum-bearing strata with the object of intensifying the extraction of the "black gold." The tests are successful. Quite recently it was even decided to increase the coefficient of utilization of the compressor to 100 percent. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Jun 80 p 2] 1386

COALDUST AVALANCHES--While working coal seams, miners sometimes face a dangerous and as yet incompletely explained phenomenon--the so-called "crazy flour shower" when an avalance of tiny coal particles bursts together with gas from a coal seam. This avalanche can travel tens and even hundreds of meters within several seconds. Thus far scientists have not found a reliable prior warning signal for this effect. A team of scientists at the Institute of Mining imeni A. A. Skochinskiy, working under the direction of Corresponding Member of the USSR Academy of Sciences A. Dokukin, has solved this problem. It is known that physical and chemical processes in coal are accompanied by the formation of free radicals--molecules with a "free" electron. Mechanical stresses are a prerequisite for the formation of free radicals. Proceeding from this premise the scientists assumed that the concentration of radicals should be higher at loci of fracture or compression of coal seams. Tests showed this to be true. Now, by utilizing this relationship, it is possible to predict dangerous areas in coal seams. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Jun 80 p 4] 1386

AIR CUSHION PILLAR--Boreholes usually are shored up with a pipe column: a steel pipe is sunk into the well and fixed into place. As a rule, this requires heavy-duty winches with a high cargo capacity. Experts at the VIOGEM [expansion unknown] have developed an easier technique: the borehole is filled with water and air is pumped with the aid of a special device under the pipe being sunk. By varying the amount of the air, the "weight" of the pipe can be increased or reduced. This makes is possible to use lightweight drilling rigs and hence also reduces well drilling time. [Text] [Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 12 Jun 80 p 4] 1386

NEW PIPELINE--Moscow--The project for a super durable pipeline for carrying oil and gas in Western Siberia and the Far North was completed by specialists of the Moscow Institute of the Petrochemical and Gas Industry. The structure is a pipe within a pipe and the space between them is filled with concrete. Moreover, as laboratory experiments showed, the internal pipe can withstand twice the norm pressure--up to 150 atmospheres. [Text] [Moscow GUDOK in Russian 14 May 80 p 1] 1386

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